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REMARKS

In response to the Examiner's Action of 12/27/2004, please amend as shown in the Amendment to the Claims Section. Please cancel claims 31-34 without prejudice to the filing of such claims in another application during the pendency of this application.

No new matter has been added by the amendment.

Rejections Under 35 U.S.C. §101 and §112

Claims 1-30 stand rejected under 35 U.S.C. §112, second paragraph, as failing to set forth the subject matter which the applicant regards as his invention on grounds that the term "predetermined" is indefinite in claims 1, 2 and any other claim in which the term is used.

The applicant has obviated this grounds of rejection by deleting the term from claims 1 and 2. The term was not used in any other claims. Removal of this grounds of rejection is requested.

Claims 1-30 stand rejected because the independent claims are vague on grounds that the applicant claims a component selected from fly ash or silica fume yet the claim itself teaches specific amounts of each component as if it is a required component of the claim. This grounds of rejection is respectfully traversed and reconsideration is requested.

Since claim 1 is typical of the objected-to wording, the applicant will discuss claim 1 only since the same argument applies to all of the applicant's other independent claims.

The paragraphs in question are as follows:

(c) a particulate material selected from the group consisting of fly ash, silica fume and mixtures thereof;

1 wherein an amount of the fly ash if present does not
2 exceed about 8% of the packageable dry blended cementitious
3 matrix composition, and

4 wherein an amount of the silica fume if present does not
5 exceed about 5% of the packageable dry blended cementitious
6 matrix composition.

7 Paragraph (c) means, of course, that either (1) fly ash is
8 present or (2) silica fume is present, or (3) both fly ash and
9 silica fume are present.

10 The next paragraph above merely adds that if fly ash is
11 present, with or without silica fume, then the amount of fly ash
12 can not exceed about 8% of the packageable dry blended cementitious
13 matrix composition.

14 The next paragraph above merely adds that if silica fume is
15 present, with or without fly ash, then the amount of silica fume
16 can not exceed about 5% of the packageable dry blended cementitious
17 matrix composition.

18 Therefore, it is believed the meaning of the claim is clear
19 and not indefinite and no amendment is necessary. Accordingly,
20 removal of this grounds of rejection is requested.

21 Claims 1-30 also stand rejected under 35 U.S.C. §112, second
22 paragraph as being made indefinite by the term "packaged dry
23 blended cementitious matrix composition" and also under 35 U.S.C.
24 §101 on grounds that it is unclear if a "package", which is an
25 article, or a "composition" is being claimed in claims 1, 2, 7 and
26 24.

27 The word "packaged" has been replaced by the word
28 "packageable" by this amendment to make it clear that it is the
29 composition that is being claimed. The applicant believes that the
30 amendment has obviated this grounds of rejection and it is clear
31 that the composition is being claimed. Accordingly, removal of
32 this grounds of rejection is requested.

1 Claims 1-30 stand rejected under 35 U.S.C. §112, second
2 paragraph as being made indefinite by the term "decorative
3 aggregate". The Office Action suggests the wording "an aggregate
4 used for a decorative purpose".

5 It is believed that one skilled in the art will have no
6 difficulty in understanding what is meant by "decorative aggregate"
7 as applicant has defined the term in the application and especially
8 on pages 9-10 and 15. The term is used in the industry without
9 confusion.

10 Decorative aggregate generally costs substantially more than
11 aggregate used merely for strength and one skilled in the art will
12 not incur the additional cost of decorative aggregate if the
13 purpose is not to produce a decorative aggregate-containing
14 surface.

15 The applicant believes the suggested terminology "an aggregate
16 used for decorative purpose" has the same meaning as the phrase
17 "decorative aggregate" and therefore no amendment is believed to be
18 necessary. Nevertheless, it is believed that the Office Action has
19 suggested that if the wording "an aggregate used for a decorative
20 purpose" is used in the claims that will obviate the rejection.
21 Because the two expressions are believed to have the same meaning,
22 the claims have been amended to the alternative wording.
23 Accordingly, reconsideration and removal of this grounds of
24 rejection is requested.

25 The term "Type V hydraulic cement" has been changed to "Type
26 5 portland cement" in the claims as required by the Examiner in the
27 Office Action.

28 It is believed that the above amendment of the claims obviate
29 all of the §101 and §112 rejections and satisfy the requirements of
30 §101 and §112, second paragraph. Accordingly, removal of all
31 rejections under 35 U.S.C. §101 and §112 is requested.

1 Rejections Under 35 U.S.C. 102 and 103

2 Claims 1-30 stand rejected under 35 U.S.C. §102(a and b) as
3 anticipated by or, in the alternative, under 35 U.S.C. §103(a) as
4 obvious over Ramme et al. '336B1, Dingsoyr '060, Garrett '802B1,
5 and Sato et al. (JP0615115-abstract only) on grounds that:

6 "All of the above cited references teach a
7 cementitious composition comprising the same components
8 as claimed by the applicant in overlapping amounts thus
9 anticipating the invention. Even if not anticipated,
10 overlapping ranges of amounts would have been prima facie
11 obvious to one of ordinary skill in the art.

12 Also, the use of a dry blend versus adding water to
13 a cement mixture would have been an obvious design choice
14 for one of ordinary skill in the art. It would have been
15 obvious to package dry mix prior to adding water because
16 it is understood that water will activate the cement
17 setting.

18 It is also old in the art to add conventional
19 additives such as superplasticizers because it is
20 commonly used in cement."

21 This grounds of rejection is respectfully traversed and
22 reconsideration is requested.

23 It is believed that it would be helpful to review the cited
24 references.

25 U.S. Patent No. 6,821,336 B1 to Ramme et al.

26 Ramme et al. disclose two types of cementitious compositions
27 both having increased electrical conductivity, and both comprising
28 portland cement and carbon fibers, -- namely (1) a concrete, and
29 (2) a controlled low-strength material or "CLSM".

1 The Concrete of Ramme et al.

2 Ramme et al. teach (Col. 4, lines 21-42) that one example
3 embodiment of the invention is a composition capable of setting to
4 produce a concrete wherein the composition includes:

- 5 (1) from about 1% to about 30% by weight portland cement,
6 (2) from about 1% to about 30% by weight fly ash having a
7 carbon content as measured by loss on ignition of greater
8 than 12%,
9 (3) from about 40% to about 90% by weight aggregate,
10 (4) from about 0.1% to about 20% by weight carbon fibers, and
11 (5) water in a sufficient amount such that the composition
12 sets to a concrete having a compressive strength of at
13 least 13.8 MPa (2000 psi), wherein all weight percentages
14 are by weight of the total composition.

15 The CLSM of Ramme et al.

16 Ramme et al. teach (Col. 5, lines 50-64) that one example
17 embodiment of the invention is a self-compacting, cementitious
18 flowable fill composition, capable of setting to produce a
19 controlled low-strength material or CLSM, wherein the composition
20 includes:

- 21 (1) from about 1% to about 30% by weight portland cement,
22 (2) from about 5% to about 85% by weight fly ash,
23 (3) from about 0.1% to about 20% by weight carbon fibers, and
24 (4) water in a sufficient amount such that the composition
25 sets to a material having a compressive strength of 8.3
26 MPa (1200 psi) or less.

27 Both the concrete and CLSM of Ramme et al. require and contain
28 carbon fibers. There is no disclosure nor suggestion in Ramme et
29 al. that their compositions will serve the purpose they are
30 intended for, i.e. increased electrical conductivity, without the
31 inclusion of carbon fibers. In fact removing the carbon fibers

1 from the compositions of Ramme et al. is a teaching away from the
2 intended use of their compositions.

3 None of the applicant's claimed compositions require or call
4 for carbon fibers to be in the compositions. Therefore, it is
5 respectfully submitted that Ramme et al. can not anticipate any of
6 the compositions claimed in the applicant's claims.

7 Furthermore, there is no disclosure nor suggestion in Ramme et
8 al. that omission of the carbon fibers from their compositions will
9 allow such modified compositions to serve as an effective premix
10 for producing a slurry with an aggregate used for a decorative
11 purpose and water, which then is useful for producing a decorative
12 aggregate-containing surface suitable for light pedestrian traffic.
13 It is not believed that one skilled in the art would be motivated
14 by the increased electrical conductivity compositions of Ramme et
15 al. to modify their compositions by omitting carbon fibers and
16 adjusting the amounts and quality of the other components of Ramme
17 et al. to produce the applicant's premix compositions as claimed
18 in independent claims 1, 2 and 24; and then to produce a slurry
19 from such premix compositions, and an aggregate used for decorative
20 purpose and water to produce decorative aggregate-containing
21 surfaces as claimed in applicant's independent claims 25 and 47
22 when there is no mention of producing a decorative aggregate-
23 containing surface in Ramme et al. Accordingly, it is believed
24 that a prima facie case of obviousness has not been established and
25 that independent claims 1, 2, 24, 25 and 47 are not made obvious by
26 Ramme et al..

27 Additional reasons for finding applicant's claims not made
28 obvious by Ramme et al. follow.

1 Concrete

2 Concrete is defined in Webster New Collegiate Dictionary,
3 1979, page 232, as a hard strong building material made by mixing
4 a cementing material (as portland cement) and a mineral aggregate
5 (as sand and gravel) with sufficient water to cause the cement to
6 set and bind the entire mass.

7 Portland Cement Association publication entitled Design and
8 Control of Concrete Mixtures, 14th Edition, 2002, page 1, states
9 that

10 "Concrete is basically a mixture of two components;
11 aggregates and paste. The paste, comprised of portland
12 cement and water, binds the aggregates (usually sand and
13 gravel or crushed stone) into a rocklike mass as the
14 paste hardens because of the chemical reaction of the
15 cement and water".

16 Therefore, it is believed to be generally understood that in
17 concrete there is both a coarse aggregate, for example gravel or
18 crushed stone, and a fine aggregate such as sand.

19 With regard to the concrete of Ramme et al., they require
20 their concrete to contain 40%-90% aggregate, preferably 60%- 80%
21 aggregate, and most preferably a mixture of 30%-40% coarse
22 aggregate and 30%-40% fine aggregate. Col. 4, lines 54-65.

23 Ramme et al. teaches that:

24 "The coarse aggregate conventionally comprises particles
25 that are greater than about 0.375 inches (9.5
26 millimeters) in size and may be gravel, granite,
27 limestone, shale and the like. The fine aggregate
28 employed in portland cement concretes is most often sand
29 (silica) comprised of particles less than about 0.375
30 inches (9.5 millimeters) in size, typically equal to or

1 less than about 0.1875 inches (4.76 millimeters) in
2 size." Col. 4, lines 13-20."

3 Thus there is no disclosure in Ramme et al. that their
4 concrete does not contain coarse aggregate, nor is there a
5 suggestion in Ramme et al. that their concrete should not contain
6 coarse aggregate.

7 Applicant's claim 1 for a packageable dry blended cementitious
8 matrix composition requires in addition to cement, two components,
9 namely,

10 (1) a quartzitic silica blend, and
11 (2) fly ash or silica fume or both,
12 neither of which are generally considered to be a coarse aggregate
13 since all of these components are smaller than 3/8 inch.

14 It is well known that fly ash and silica fume are not coarse
15 aggregates. For example, fly ash is described in Design and
16 Control of Concrete Mixtures, 14th Edition, 2002, as a powder
17 resembling cement (page 58, FIG. 3-3, copy enclosed). Silica fume
18 is also referred to in the same publication as microsilica (page
19 60, copy enclosed).

20 Accordingly, it is respectfully submitted that since
21 applicant's claim 1 does not have a coarse aggregate nor carbon
22 fibers, that Ramme et al. concrete does not, and can not, make
23 applicant's claim 1 obvious.

24 Regarding the applicant's independent claim 2, which employs
25 the transitional phrase "consisting essentially of", the applicant
26 has stated what is meant by the wording "consisting essentially of"
27 on page 34 of the application. Thus, the claim language of claim
28 2, namely, "the packageable dry blended cementitious matrix
29 composition consisting essentially of" excludes the inclusion of an

1 ingredient not specifically recited unless permitted as a qualified
2 exceptions on page 34 of the instant application. Therefore,
3 applicant's claim 2 is not open to the inclusion of coarse
4 aggregate, or gravel, granite, limestone, or shale.

5 Applicant's independent claim 24, which also claims a
6 packageable dry blended cementitious matrix composition, uses the
7 transitional phrase "consisting of" which also excludes the
8 inclusion of other ingredients (except for impurities ordinarily
9 associated therewith) not specifically recited. Thus, applicant's
10 claim 24 is not open to the inclusion of coarse aggregate, or
11 gravel, granite, limestone, or shale.

12 Therefore, these are additional reasons why it is believed
13 that applicant's independent claims 1, 2 and 24 for a packageable
14 dry blended cementitious matrix composition are not made obvious by
15 the concrete of Ramme et al.

16 CLSM

17 Turn now to the controlled low-strength material or CLSM of
18 Ramme et al., they teach that their CLSM shares properties with
19 both soils and concrete. The CLSM is prepared from materials (i.e.
20 portland cement, water, optionally coarse aggregate, and optionally
21 fine aggregate) similar to the concrete described above (in Ramme
22 et al.) but also exhibits properties of soils. As claimed by Ramme
23 et al., when water is added to their CLSM formulation it sets to a
24 compressive strength of about 8.3 MPa (1200 psi) or less, and in
25 one embodiment to 2.1 MPa (300 psi). (Col. 5, lines 20-40 and claim
26 10.)

27 Unless a composition that has the properties of soils is
28 desired, it is respectfully submitted that one skilled in the art
29 is not going to be motivated from the teaching of Ramme et al. to
30 start with the CLSM of Ramme et al., delete the carbon fibers,

1 select the optional fine aggregate but ignore the optional coarse
2 aggregate to arrive at the applicant's packageable dry blended
3 cementitious matrix composition of his independent claims 1, 2 and
4 24.

5 Nor is one skilled in the art from the teaching of Ramme et
6 al. going to be motivated to use a modified CLSM to form a
7 decorative aggregate-containing cementitious slurry as claimed in
8 applicant's of his independent claims 25 and 47.

9 Ramme et al. do not disclose nor suggest that their
10 compositions can be used as is, or modified, to form the
11 packageable dry blended cementitious matrix composition as claimed
12 in independent claims 1, 2 and 24 to form a slurry with an
13 aggregate used for decorative purpose and water as claimed in
14 applicant's independent claims 25 and 47, for producing a
15 decorative aggregate-containing surface suitable for light
16 pedestrian traffic.

17 Nor do Ramme et al. disclose or suggest that their slurry
18 compositions can be modified by adding an aggregate used for a
19 decorative purpose to produce a decorative aggregate-containing
20 surface suitable for light pedestrian traffic.

21 The question to be asked is where is the motivation for one
22 skilled in the art to look for a cementitious composition
23 formulated for a particular characteristic (increased electrical
24 conductivity) and for a particular utility (providing an electrical
25 pathway for grounding of equipment from stray currents or
26 lightening strikes and other increased electrical conductivity
27 usages) in the prior art, then remove the component (carbon fibers)
28 in such cementitious composition that contributes to the particular
29 characteristic in the prior art composition so that it is closer to
30 applicant's claimed composition, and use the thusly modified

1 composition for a new purpose (for producing a decorative
2 aggregate-containing surface suitable for light pedestrian
3 traffic), when such use was of no concern in and of the prior art
4 composition. For example, there is no mention of cementitious
5 matrix composition for producing a decorative aggregate-containing
6 cementitious slurry, or a slurry for producing a decorative
7 aggregate-containing surface in Ramme et al. It is respectfully
8 submitted that the motivation to do so is nonexistent in Ramme et
9 al. and holding applicant's composition obvious would seem to be
10 "hindsight" based on the applicant's own disclosure.

11 The facts that a prior art device could be modified so
12 as to produce the claimed device is not a basis for an
13 obviousness rejection unless the prior art suggested the
14 desirability of such a modification. In re Gordon, 221
15 USPQ 1125 (Fed. Cir 1984).

16 Therefore, it is respectfully submitted that the rejection of
17 the applicant's claims based on Ramme et al. ignores the teaching
18 and fair suggestion in Ramme et al.

- 19 (1) that all of their compositions, i.e. concrete and CLSM,
20 require the inclusion of carbon fibers, and
21 (2) that there is no disclosure nor suggestion that their
22 compositions would be useful for producing a decorative
23 aggregate-containing surface suitable for light
24 pedestrian traffic.

25 It is respectfully submitted that:

26 The ever present question in cases within the ambit
27 of 35 U.S.C. 103 is whether the subject matter as a
28 whole would have been obvious to one of ordinary
29 skill in the art following the teachings of the
30 prior art at the time the invention was made. It
31 is impermissible within the framework of section
32 103 to pick and choose from any one reference only

1 so much of it as will support a given position, to
2 the exclusion of other parts necessary to the full
3 appreciation of what such reference fairly suggests
4 to one of ordinary skill in the art. In re
5 Rothermel, 47 CCPA 886, 276 F.2d 393, 125 USPQ
6 328; In re Wesslau, 147 USPQ 391, 393, 353 F.2d
7 238.

8 Relative to rejections predicated on 35 U.S.C. 103, prior
9 patents are references for only what they clearly disclose or
10 suggest. In re Randol and Redford 165 USPQ 586 (CCPA, 1970).

11 Accordingly, it is believed that all of the applicant's claims
12 now in the application are allowable over Ramme et al. and
13 allowance is requested.

14 *****

15 U.S. Patent No. 4,935,060 to Dingsoyr

16 Dingsoyr discloses a cement slurry for cementation of oil
17 wells, and in particular for the for cementation of oil wells which
18 are drilled through high pressure formations using high density
19 slurries in order to avoid uncontrolled blow-out. (Col. 1, lines
20 45-47).

21 Dingsoyr also discloses that high density cement slurries are
22 produced by adding an inert high density filler material such as
23 for example barite. (Col. 2, lines 46-48).

24 Dingsoyr's high density cement slurry consisting essentially
25 of:

- 26 (1) - - - a hydraulic cement, and base on the weight of
27 the cement the following additional
28 components:

1 (2) 5-85% microsilica,
2 (3) 5-250% high density filler selected from the group
3 consisting of barite, hematite and ilmenite,
4 (4) 0-5% of a retarder (dry weight),
5 (5) 0-12% thinner (dry weight),
6 (6) 0-8% fluid loss additive (dry weight),
7 (7) 0-45% silica material selected from the group
8 consisting of silica flour and silica sand,
9 and
10 (8) - - - water in such an amount that the cement slurry
11 has a density between 1.95 and 2.40 g/cm³.
12 (Col. 3, lines 7-19 and 55-57, and Claim 1).

13 Barite is barium sulfate and has a density of 4.5 g/cm³;
14 hematite is iron (III) oxide having a density of 5.24 g/cm³, and
15 ilmenite is iron titanium oxide FeTiO₃ having a density of 4.44 -
16 4.94 g/cm³; all three are minerals and/or ores. McGraw-Hill,
17 Dictionary of Scientific and Technical Terms, 1994.

18 These three materials are not shown nor alleged in the instant
19 Office Action to have any particular property or significance, or
20 be equivalent to any of the components in the applicant's
21 packageable dry blended cementitious matrix composition as claimed
22 in independent claims 1, 2 and 24, nor the applicant's decorative
23 aggregate-containing cementitious slurry as claimed in independent
24 claims 25 and 47.

25 Neither barite, nor hematite, nor ilmenite, nor any other high
26 density material is required or called for in the applicant's
27 claims. Since these materials are high density minerals it is not
28 believed they would serve any useful purpose in the applicant's
29 compositions. Since one of these mineral components is required
30 for Dingsoyr's cement slurry and not required or called for in any

of the applicant's claims, Dingsoyr can not anticipate applicant's claims.

Since the rejection is also based on obviousness on grounds that the overlapping ranges of amounts are prima facie obvious to one of ordinary skill in the art, it is believed helpful to compare the ranges as best one can.

Dingsoyr expresses his components as a percent based on the weight of cement which is on a different basis than that in applicant's independent claims. To make a comparison applicant will give the broadest interpretation possible to Dingsoyr's formulations. Thus for 100 parts of cement Dingsoyr requires at least the following:

- - - - - Dingsoyr - - - - -				Applicant
<u>Parts</u>	<u>Component</u>	<u>% Range</u>		<u>% Range</u>
100	cement	<21-91		20-35
5-85	microsilica (silica fume)	< 1-77		< 5
5-250	high density filler	< 2-70		0
0-45	silica flour or silica sand	0-29		50-79

The above upper percentage for silica flour or silica sand was calculated as follows: $45/(100 + 5 + 5 + 45) = 29.0\%$.

The retarder, thinner and fluid loss additive in Dingsoyr's compositions have been ignored since they can be zero and since their effect on the percents would only be to lower Dingsoyr's percentage ranges.

It can be seen that silica flour or silica sand range of amounts is substantially below the range of amounts of quartzitic silica blend (about 50% to about 79%) in the applicant's packageable dry blended cementitious matrix composition as claimed in independent claims 1, 2 and 24. The range of barite, hematite, and/or ilmenite in Dingsoyr, slurry can not overlap with that of

1 the applicant's claims because these mineral components are not
2 call for in the applicant's claims. Therefore, the applicant's
3 claims can not be anticipated by nor made obvious by Dingsoyr.

4 Furthermore, omitting the mineral component from Dingsoyr's
5 slurry would defeat the intended purpose of Dingsoyr's slurry since
6 to do so would not produce a high density slurry for the
7 cementation of high pressure oil wells. Such an omission would be
8 a teaching away from that which Dingsoyr fairly suggests is
9 necessary for his invention.

10 Still further, these three high density materials are excluded
11 from the applicant's packageable dry blended cementitious matrix
12 composition of independent claims 2 and 24 by the transitional
13 phrases of those claims for the same reasons as discussed earlier
14 with regard to the rejection based on Ramme et al.

15 With regard to applicant's decorative aggregate-containing
16 cementitious slurry as claimed in independent claims 25 and 47,
17 there is no disclosure nor suggestion in Dingsoyr that his slurry
18 should contain an aggregate used for a decorative purpose.
19 Therefore, the range of amounts of the decorative aggregate in
20 applicant's independent claims 25 and 47 do not overlap with
21 Dingsoyr and, therefore, can not be anticipated or made obvious by
22 Dingsoyr.

23 With regard to applicant's claim 47 for a decorative
24 aggregate-containing cementitious slurry, the dense mineral
25 component of Dingsoyr is also excluded by the transitional phrase
26 "consisting essentially of" in lines 4-5 and therefore can not be
27 made obvious by Dingsoyr.

28 The question to be asked is where is the motivation for one
29 skilled in the art to look for a cementitious composition

1 formulated for a particular characteristic (high density) and for
2 a particular utility (for cementation of high pressure oil wells)
3 in the prior art, then remove the component (barite, hematite or
4 ilmenite) in such cementitious composition that contributes to the
5 particular characteristic in the prior art composition so that it
6 is closer to applicant's claimed composition, and use the thusly
7 modified composition for a new purpose (for producing a decorative
8 aggregate-containing surface suitable for light pedestrian
9 traffic), when such use of the modified composition was of no
10 concern in and of the prior art composition. For example, there is
11 no mention of cementitious matrix composition for producing a
12 decorative aggregate-containing cementitious slurry, or a slurry
13 for producing a decorative aggregate-containing surface in
14 Dingsoyr. It is respectfully submitted that the motivation to do
15 so is nonexistent in Dingsoyr and to do so would seem to be
16 "hindsight" based on the applicant's own disclosure.

17 For the above reasons it is believed that the applicant's
18 independent claims 1, 2, 24, 25 and 47 can not be anticipated by
19 nor made obvious by Dingsoyr. Accordingly, allowance of all of the
20 applicant's claims is requested.

21 With regard to fly ash, Dingsoyr is silent on the inclusion of
22 fly ash in his concrete or CLSM. Therefore, applicant's claims 15,
23 16 and 17 that require his packageable dry blended cementitious
24 matrix composition to include fly ash, can not be anticipated nor
25 made obvious by Dingsoyr.

26 Applicant's new claims 36, 39 and 42 that require that in his
27 packageable dry blended cementitious matrix composition that the
28 particulate material selected from the group consisting of fly ash,
29 silica fume and mixtures thereof, be fly ash, can not be made
30 obvious by Dingsoyr because these claims not only contain fly ash
31 but they do not contain silica fume and there is no suggestion in

1 Dingsoyr that fly ash can be substituted for silica fume or barite,
2 hematite, or ilmenite.

3 Likewise, applicant's new claim 46 that requires that in his
4 decorative aggregate-containing cementitious slurry that the
5 packageable dry blended cementitious matrix composition that the
6 particulate material selected from the group consisting of fly ash,
7 silica fume and mixtures thereof, be fly ash, can not be made
8 obvious by Dingsoyr because claim 45 not only contains fly ash but
9 it does not contain silica fume and there is no suggestion in
10 Dingsoyr that fly ash can be substituted for silica fume or barite,
11 hematite, or ilmenite.

12 Accordingly, it is believed that all of the applicant's claims
13 now in the application are allowable over Dingsoyr and allowance is
14 requested.

15 *****

16 U.S. Patent No. 6,324,802 B1 to Garrett

17 Garrett discloses a swimming pool interior finish designed to
18 mask or hide spot etching of the pool finish. Garrett points out
19 that usually pool finishes are pool plaster or marcite which are
20 normally composed of white cement, aggregates such as crushed
21 marble and limestone, and white silica sand (Col. 1, lines 9-13).
22 Garrett discloses that the problem with plaster and marcite is that
23 they tend to stain, etch, scale and show other forms of mineral
24 precipitation and that etching may result in the appearance of
25 generally rounded spots having a size of about 1/8 to 3/4 inch
26 generally referred to as spot etching. Spot etching is said to be
27 due to the increased use of acidic swimming pool and spa sanitizers
28 (Col. 1, lines 21-33).

1 Garrett further discloses that in the mid 1980s the swimming
2 pool industry began experimenting with exposed aggregate surfaces
3 produced by mixing cement and water with small rounded pebbles or
4 other small aggregates and applying the mixture to the interior of
5 a pool, spa or other water basin. The major advantages of such
6 exposed pebbles, beads or other aggregate are said to make the
7 damage from aggressive water less visible, and that the irregular
8 appearance of the aggregate surface hides many types of surface
9 stains, normal mottling or shade variations in traditional plaster
10 or marcite (Col. 1, line 49 to Col. 2, line 5).

11 Garrett teaches that severe mineral buildups develop in pools
12 at the water line, with plaster and marcite as well as with exposed
13 aggregate surfaces. With pools lined with ceramic tile at the
14 water line such mineral buildups can be removed. However, with
15 exposed aggregate surfaces such buildups are extremely difficult to
16 remove (Col. 2, lines 42-55).

17 Another problem mentioned by Garrett is that shrinkage cracks
18 still tend to develop in the finishes (Col. 3, lines 21-22).
19 Garrett teaches that his basin interior finish for contacting an
20 aqueous medium are designed to reduce cracking. (Col. 3, lines 24-
21 29).

22 Garrett's examples of basins are swimming pools, spas and
23 fountains basins. Garrett's interior finish composition includes

- 24 (1) at least one more aggregate,
25 (2) at least one binder for the aggregate,
26 (3) at least one pozzolan that must include silica fume, and
27 (4) at least one set retarder (Col. 9, claim 1).

28 Garrett teaches that the set retarder is an ingredient which
29 delays setting or hardening of the interior finish produced from
30 the composition and will typically be an inorganic salt with borate

1 salts preferred, and that it is particularly advantageous for the
2 set retarder to be a polyborate salt such as sodium tetraborate
3 pentahydrate or lithium tetraborate (Col. 4, line 65 to Col. 5,
4 line 6).

5 Excluding the set retarder limitation, one skilled in the art
6 will know that such unspecified amounts for the four components
7 (i.e. aggregate, binder, silica fume and set retarder) will include
8 a vast number of compositions, quite possibly for a vast number of
9 uses, and quite possibly for totally unrelated types of
10 construction, in addition to Garrett's use in basins, if not
11 limited to a basin designed to contact an aqueous medium and at
12 least compositions similar to those of his nine examples.

13 The only utility taught and suggested for his product is as an
14 interior finish for a basin, namely a pool, spa or fountain, and in
15 which the interior finish is in contact with an aqueous medium.

16 The only aggregate that Garrett uses in his nine examples is
17 pebble, except for Example 6 in which the aggregate is about 99%
18 pebble and 1% synthetic ceramic particles. All nine of Garrett's
19 Examples include sodium tetraborate pentahydrate as a retarder,
20 which Garrett has stated is a particularly advantageous retarder.

21 Garrett further teaches that silica fume increases the
22 resistance of the interior finish to attack by aggressive aqueous
23 media, reduces the thickness of the weak interfacial transition
24 zone between the cement binder and the aggregate or aggregates, and
25 reduces carbonation and the reaction associated with alkali-silica
26 reactivity that can lead to cracks and expansive gel formation
27 (Col. 3, lines 48-59). Since Garrett's product is design to hide
28 spot etching by masking with pebble or similarly sized aggregate,
29 such pebble or pebble-sized aggregate is essentially a required

1 component of his interior finish composition since without pebble
2 or pebble sized aggregate spot etching will be more easily seen.

3 Garrett does not disclose the size of the pebble. Therefore,
4 there is no clear teaching of pebble size in Garrett. However,
5 Garrett does teach that the round spots formed by spot etching have
6 a size of about 1/8 to 3/4 inch (Col. 1, line 24). If pebble is to
7 hide such spots the pebble must be about the same size as such
8 spots. However, pebble is defined in McGraw-Hill, Dictionary of
9 Scientific and Technical Terms, 1994, page 1088, copy enclosed, as:

10 A clast, larger than a granule and smaller than a cobble
11 having a diameter in the range of 4-64 mm (0.16 inch to
12 2.54 inch).

13 Applicant's independent claims 1, 2 and 24, for a packageable
14 dry blended cementitious matrix composition requires

- 15 (1) a hydraulic cement selected from the group consisting of
16 Type V portland cement and white portland cement,
17 (2) a quartzitic silica blend, and
18 (3) fly ash or silica fume or both,
19 none of which are coarse aggregate.

20 Therefore, since the applicant's independent claims 1, 2 and
21 24, for a packageable dry blended cementitious matrix composition,
22 do not call for coarse aggregate, nor a pebble or pebble-sized
23 aggregate, these claims are not anticipated nor disclosed nor
24 suggested by Garrett's pebble or pebble-sized aggregate-containing
25 compositions illustrated by his Examples 1-9.

26 Since the grounds of rejection is based on the allegation of
27 overlapping ranges of amounts of applicant's components with those
28 of Garrett it is believed helpful to review such amounts in
29 Garrett.

1 In Garrett's Examples 1-9, the range of the amounts of cement
2 is from 46.0% (Example 4) to 46.7% (Example 1). No other
3 percentages on a dry basis of cement in Garrett's interior finish
4 are disclosed.

5 The amount of hydraulic cement in applicant's packageable dry
6 blended cementitious matrix compositions as claimed in independent
7 claims 1, 2 and 24 is from about 20% to about 35%. Clearly, the
8 range of amounts of cement in Garrett and that in applicant's
9 independent claims 1, 2 and 24 do not overlap with that taught or
10 suggested by Garrett's nine Examples. In fact there appears to be
11 a substantial difference in the amount of cement in Garrett
12 interior finish than that claimed by the applicant in independent
13 claims 1, 2 and 24. Accordingly, it is believed that a prima facie
14 case of obviousness has not been established.

15 Furthermore, when a slurry is prepared from applicant's
16 packageable dry blended cementitious matrix composition, and an
17 aggregate used for a decorative purpose and water, the percentages
18 of hydraulic cement in the slurry on a dry basis becomes even
19 smaller than the about 20% to about 35% in the packageable dry
20 blended cementitious matrix composition claimed in applicant's
21 independent claims 1, 2 and 24. For example, when 60 lbs of dry
22 blended cementitious composition, i.e. packageable dry blended
23 cementitious matrix composition, and 20-50 lbs. of decorative
24 aggregate (an aggregate used for a decorative purpose) as claimed
25 in applicant's independent claims 25 and 47, are used to form a
26 decorative aggregate-containing cementitious slurry, the range of
27 amounts of hydraulic cement becomes even smaller and drops to about
28 11% to about 26%. These percents are calculated as follows:

29 $(20\% \times 60 \text{ lbs}) / (60 \text{ lbs} + 50 \text{ lbs}) = 11\%$ minimum cement on
30 a dry basis, and

31 $(35\% \times 60 \text{ lbs}) / (60 \text{ lbs} + 20 \text{ lbs}) = 26\%$ maximum cement on
32 a dry basis.

1 Thus, range of amounts of cement in Garrett compositions on a
2 dry basis, i.e. 46.1% - 46.7%, does not overlap with the range of
3 amount of hydraulic cement in applicant's decorative aggregate-
4 containing cementitious slurry on a dry basis, i.e about 11% - 26%,
5 as claimed in applicant's independent claims 25 and 47. Again
6 there appears to be a substantial difference in the amount of
7 cement in Garrett interior finish slurry than that claimed by the
8 applicant in independent slurry claims 25 and 47 and such claimed
9 ranges do not overlap. Therefore, it is believed that a prima
10 facie case of obviousness has not been established with regard to
11 applicant's independent claims 1, 2 and 24.

12 Similarly range of amounts of aggregate (pebbles and ceramic
13 particles) in Garrett's Examples 1-9 ranges from 49.0% (Example 4)
14 to 50.0% (Example 8) on a dry basis.

15 The applicant's range of amounts of aggregates (quartzitic
16 silica blend plus decorative aggregate) in his slurry as claimed in
17 independent claims 25 and 47 is about 62.5% to about 88.6% on a dry
18 basis, which does not overlap with Garrett's range of amounts. The
19 applicant's percentages of aggregate are calculated as follows: ,

20 $((50\% \times 60 \text{ lbs}) + 20 \text{ lbs}) / 80 \text{ lbs} = 62.5\%$ minimum
21 aggregate on a dry basis, and

22 $((79\% \times 60 \text{ lbs}) + 50 \text{ lbs}) / 110 \text{ lbs} = 88.6\%$ maximum
23 aggregate on a dry basis.

24 Therefore, the range of amounts of aggregate in applicant's slurry
25 do not overlap. Accordingly for this reason it is believed that a
26 prima facie case of obviousness has not been established with
27 regard to applicant's independent claims 24 and 47.

28 It is respectfully submitted

- 29 (1) that since the intended utility of Garrett's composition
30 as an interior finish in a basin for contacting an
31 aqueous medium is unrelated to the intended utility of

1 the applicant's compositions to produce a decorative
2 aggregate-containing surface suitable for light
3 pedestrian traffic, and

4 (2) that since the cement ranges in applicant's independent
5 claims 1, 2, 24, 25 and 47 do not overlap with that
6 disclosed or suggested by Garrett,

7 that Garrett does not anticipate nor disclose nor suggest the
8 applicant's packageable dry blended cementitious matrix composition
9 as claimed in applicant's independent claims 1, 2 and 24, nor
10 applicant's decorative aggregate-containing cementitious slurry as
11 claimed in applicant's independent claims 25 and 47.

12 Furthermore, applicant's claim 7 and newly added dependent
13 claims 35, 38 and 41 for a packageable dry blended cementitious
14 matrix composition, which depend on claim 1, 2 and 24,
15 respectively, requires that all of the particles of the quartzitic
16 silica blend pass through Standard Sieve Size No. 4 (about 0.187
17 inch) thereby reducing the maximum particles well below the maximum
18 particle size for a fine aggregate. Thus, applicant's claims 7 and
19 35, 38 and 41 are not anticipated nor made obvious by Garrett's
20 pebble-containing dry mix.

21 The applicant's decorative aggregate-containing cementitious
22 slurry as claimed in independent claims 25 and 47 requires water in
23 an amount that when mixed with the packageable dry blended
24 cementitious matrix composition and the decorative aggregate
25 produces slurry having a slump of at least about 2 inches.
26 Applicant's dependent claim 28 requires that the amount of water in
27 the decorative aggregate-containing cementitious slurry produces a
28 slurry having a slump of at least about 3 inches. The applicant's
29 dependent claim 29 requires that the amount of water in the
30 decorative aggregate-containing cementitious slurry produces a
31 slurry having a slump of from about 3 inches to about 5 inches.

1 Garrett does not disclose what the slump value is of his
2 interior finish slurry. Rather Garrett discloses only that:

3 "The dispersing agent allows the amount of silica fume in
4 a cementitious composition to be increased without
5 significantly increasing the water demand. Thus, when a
6 cementitious composition is mixed with water, the weight
7 ratio of water to cementitious material should be no
8 higher than 0.55, and ideally no higher than 0.5. If the
9 weight ratio of water to cementitious material exceeds
10 0.55, the strength of the final product is negatively
11 affected." (Col. 9, lines 40-48).

12 This ratio in all of Garrett's nine examples is about 0.5, where
13 the cementitious material is the cement plus silica fume.

14 Thus, from the disclosure of Garrett it is not believed that
15 one skilled in the art will know what the slump value of Garrett
16 interior finish slurry is, however, it is believed that slump
17 values greater than about 1 inch would not adhere to a vertical
18 pool wall. Accordingly, it is not believed that Garrett's interior
19 finish slurry anticipate or makes obvious applicant's decorative
20 aggregate-containing cementitious slurry as set forth in
21 independent claims 25 and 47 which require a slump value of at
22 least about 2 inches, nor claim 28 which requires a slump value of
23 at least about 3 inches, nor claim 29 which requires a slump value
24 of from about 3 inches to about 5 inches.

25 The amount of water in a cementitious composition is not a
26 variable that may be adjusted merely to achieve a required slump
27 without regard to the intended use of the composition since the
28 amount of water will effect not only the slump value but also other
29 properties of the slurry and the set product. In fact all
30 components of the mix and the percentages of each components are
31 important. Furthermore, the time to mix and install cementitious
32 compositions are also important which makes the availability of

1 premixes and their compositions also important to producing an
2 economical quality product for the intended use.

3 With this in mind, and returning to applicant's packageable
4 dry blended cementitious matrix composition, it is clear that the
5 aggregate that Garrett intends to use is pebble or similarly sized
6 aggregate. In all of Garrett's 9 Examples the aggregate is pebble.
7 However, Garrett states that the preferred aggregate is pebble
8 although other aggregates can be employed among which are synthetic
9 ceramic particles, spherical plastic beads, spherical glass beads,
10 tumbled glass particles, crushed calcite, crushed rock, silica sand
11 and calcite sand (Col. 4, lines 32-45). It is respectfully
12 submitted that use of only a fine aggregate in Garrett's interior
13 finish would be in conflict with the intention of Garrett to mask
14 or hide spot etching, and therefore using only a fine aggregate
15 without pebble or pebble-sized aggregate would be a teaching away
16 from the clear purpose of Garrett's interior finish, namely to mask
17 or hide spot etching, surface stains, mottling and shade
18 variations.

19 "Even when obviousness is based on a single prior art
20 reference, there must be a showing of a suggestion or
21 motivation to modify the teachings of that reference. See
22 B.F. Goodrich Co. v. Aircraft Breaking Sys. Corp., 72
23 F.3d 1577, 1582, 37 USPQ 2d 1314, 1318 (Fed.Cir. 1996)."
24

25 "While the test for establishing an implicit teaching,
26 motivation, or suggestion is what the combination of
27 these two statements of Evans [a prior art reference]
28 would have to suggest to those of ordinary skill in the
29 art, the two statements cannot be viewed in the abstract.
30 Rather, they must be considered in the context of the
31 teaching of the entire reference. Further, a rejection
32 cannot be predicated on the mere identification in Evans
33 [the reference] of individual components of claimed

1 limitations. Rather, particular findings must be made as
2 to the reason the skilled artisan, with no knowledge of
3 the claimed invention, would have selected these
4 components for combination in the manner claimed." In re
5 Kotzab 217 F.3d 1365 (Fed. Cir. 6/30/2000).

6 Thus, it is respectfully submitted that Garrett's statements on
7 aggregate size should not be viewed in the abstract, but rather
8 only in the context of his entire disclosure and what he seek to
9 accomplish.

10 Furthermore, what is the amount of fine aggregate that one
11 skilled in the art from a reading of Garrett would use in preparing
12 Garrett's interior finish slurry. Garrett appears to be totally
13 silent on this point. There is no fine aggregate in Garrett's nine
14 examples. Therefore, there is no clear teaching in Garrett of the
15 amount of fine aggregate in his interior finish. Since there is no
16 disclosure of the amount of fine aggregate in Garrett for his
17 interior finish, how is one skilled in the art to arrive at the
18 amount of quartzitic silica blend in applicant's packageable dry
19 blended cementitious matrix composition from Garrett's disclosure
20 except by the applicant's disclosure.

21 Again applicant submits that relative to rejections predicated
22 on 35 U.S.C. 103, prior patents are references for only what they
23 clearly disclose or suggest. In re Randol and Redford, Idem.

24 With regard to fly ash, Garrett is silent on the inclusion of
25 fly ash in his interior finish. Therefore, applicant's claims 15,
26 16 and 17 that require his packageable dry blended cementitious
27 matrix composition to include fly ash, can not be anticipated or
28 made obvious by Garrett which does not mention fly ash.

29 Similarly, applicant's new claims 36, 39 and 42 that require
30 that in the packageable dry blended cementitious matrix composition

1 that the particulate material selected from the group consisting of
2 fly ash, silica fume and mixtures thereof, be fly ash, can not be
3 made obvious by Garrett because the claims 36, 39 and 42 not only
4 contains fly ash (which Garrett's interior finish does not) but
5 claims 36, 39 and 42 do not contain silica fume (which Garrett's
6 interior finish does), and there is no suggestion in Garrett that
7 fly ash can be substituted for silica fume.

8 Likewise, applicant's new claim 45 that requires that in his
9 decorative aggregate-containing cementitious slurry that the
10 packageable dry blended cementitious matrix composition that the
11 particulate material selected from the group consisting of fly ash,
12 silica fume and mixtures thereof, be fly ash, can not be made
13 obvious by Garrett because claim 45 not only contains fly ash but
14 it does not contain silica fume and there is no suggestion in
15 Garrett that fly ash can be substituted for silica fume or barite,
16 hematite, and/or ilmenite.

17 Therefore, while Garrett's compositions for an interior finish
18 in contact with an aqueous medium are interesting, it is
19 respectfully submitted that there are many reasons why Garrett does
20 not disclose or suggest the applicant's packageable dry blended
21 cementitious matrix composition as claimed in independent claims 1,
22 2 and 24, nor his decorative aggregate-containing cementitious
23 slurry for producing a durable decorative aggregate-containing
24 surface for light pedestrian traffic as claimed in independent
25 claims 25 and 47.

26 As mentioned earlier, excluding the set retarder limitation,
27 one skilled in the art will know that such unspecified amounts for
28 the four components (i.e. aggregate, binder, silica fume and set
29 retarder) will include a vast number of compositions, quite
30 possibly for a vast number of uses, and quite possibly for totally
31 unrelated types of construction, in addition to Garrett's use in

1 basins, if not limited to a basin designed to contact an aqueous
2 medium and at least compositions similar to those of his nine
3 examples.

4 With this in mind, it has been held that a prior art reference
5 that discloses a generic formula encompassing a claimed composition
6 would not have provided the requisite motivation to select that
7 composition because the reference (a) disclosed a "vast number" of
8 possibilities, and (b) gave as "typical", "preferred," and
9 "optimum" examples that "are different from and more complex than"
10 the claimed composition. In re Baird, 16 F.3d 380, 29 USPQ2d 1550
11 (Fed. Cir. 1994).

12 Garrett further teaches that it is particularly advantageous
13 for the set retarder to be a polyborate salt such as sodium
14 tetraborate pentahydrate or lithium tetraborate. (Col. 4, line 65
15 to Col. 5, line 6).

16 None of applicant's claims call for a borate salt set
17 retarder, including the sodium tetraborate pentahydrate or lithium
18 tetraborate required in Garrett's claim 1. There is no disclosure
19 nor suggestion in Garrett that fly ash can be used as a substitute
20 set retarder in his interior finish compositions.

21 Accordingly, it is believed that all of the applicant's claims
22 now in the application are allowable over Garrett and allowance is
23 requested.

24 *****

25 Japanese Patent No. JP 066157115 - Abstract only to Sato et al.

26 All of applicant's claims stand rejected as anticipated by or
27 obvious over Sato et al. (abstract only). Another English abstract
28 of the Sato et al. patent obtained from the esp@cenet database,

1 copy enclosed, is believed to be useful in better understanding
2 this reference.

3 Based on these two translated abstracts applicant believes
4 Sato et al. discloses a composition with the following weight
5 percentage:

- 6 (1) 30-70% portland cement,
- 7 (2) 3-30% fine blast furnace slag powder and/or fly ash,
- 8 (3) 3-30% silica fume,
- 9 (4) 0-50% silica sand,
- 10 (5) 0- 5% gypsum,
- 11 (6) 0- 1% thickeners,
- 12 (7) 0- 1% fibers, with
13 (to cement)
- 14 (8) 0-2.5% superplasticizers,
- 15 (9) 1- 9% epoxy resins (as resin solid), and
- 16 (10) water, and

17 that the mixture formed therefrom is extruded to produce a molded
18 body superior in bending strength and water resistance.

19 Applicant's packageable dry blended cementitious matrix
20 composition as claimed in independent claims 1, 2 and 24 requires
21 50-79% quartzitic silica blend but no epoxy resins, whereas Sato et
22 al. requires 0-50% silica sand and 1-9% epoxy resins.

23 It is believed that if the epoxy resins were omitted from the
24 composition of Sato et al. it would not produce a molded body
25 superior in bending strength and water resistance. Such an
26 omission would therefore be a teaching away from that which Sato et
27 al. fairly suggest is necessary for their invention to have the
28 stated properties, namely be extrudable and have superior bending
29 strength and water resistance.

1 Applicant's claim 1 for a packageable dry blended cementitious
2 matrix composition specifically excludes reactive resins and
3 hardeners therefor, epoxy and mixtures thereof, and gypsum. The
4 transitional phases in applicant's similar independent claims 2 and
5 24 are not open to the inclusion of epoxy resins as discussed
6 earlier with regard to Ramme et al. Therefore, it is not believed
7 that the translated abstracts of Sato et al. anticipate or
8 establish a prima facie case of obviousness of applicant's
9 independent claims 1, 2 and 24.

10 Applicant's independent claims 25 and 47 for decorative
11 aggregate-containing cementitious slurry require an aggregate used
12 for decorative purpose, whereas Sato et al. does not. The amount
13 of decorative aggregate in applicant's claims 25 and 47 is from
14 about 25% to about 45%. Therefore, it is not believed that the
15 English abstracts of Sato et al. anticipate or establish a prima
16 facie case of obviousness of applicant's independent claims 25
17 and 47.

18 Since the utility of Sato et al. composition is to form an
19 extruded molded body, whereas the utility of applicant's

20 (1) packageable dry blended cementitious matrix composition

21 as claimed in independent claims 1, 2 and 24, and

22 (2) decorative aggregate-containing cementitious slurry as

23 claimed in independent claims 25 and 47,

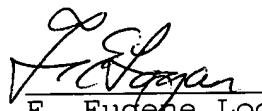
24 is to produce a decorative aggregate-containing surface for light
25 pedestrian traffic, it is not believed that one skilled in the art
26 would be motivated to modify the composition of Sato et al. to
27 produce the packageable dry blended cementitious matrix
28 composition, or the decorative aggregate-containing cementitious
29 slurry of the applicant to produce a decorative aggregate-
30 containing surface.

31 Excluding the requirement for the epoxy resin limitation for
32 the composition of Sato et al., one skilled in the art will know

1 that such broad amounts, four of which include zero percentage
2 (silica sand, gypsum, thickeners and fibers), and four of which
3 require some finite amount (portland cement), will include a vast
4 number of compositions, quite possibly for a vast number of uses,
5 and quite possibly for totally unrelated types of construction, in
6 addition to Sato et al.'s use for producing a extrudable product,
7 if not at least limited to extrudable products having an epoxy
8 resin in the composition. In re Baird, Idem.

9 There isn't any motivation to one skilled in the art in Sato
10 et al. to delete required epoxy resins needed for extrudable
11 product to make a composition for totally different and unrelated
12 product. Therefore, it is not believed that the applicant's
13 packageable dry blended cementitious matrix composition as set
14 forth in independent claims 1, 2 and 24, and decorative aggregate-
15 containing cementitious slurry as set forth in independent claims
16 25 and 47 are anticipated or made obvious by Sato et al.
17 Accordingly reconsideration and allowance of all of Applicants'
18 claims is requested.

19 Respectfully submitted,

20  4-25-05
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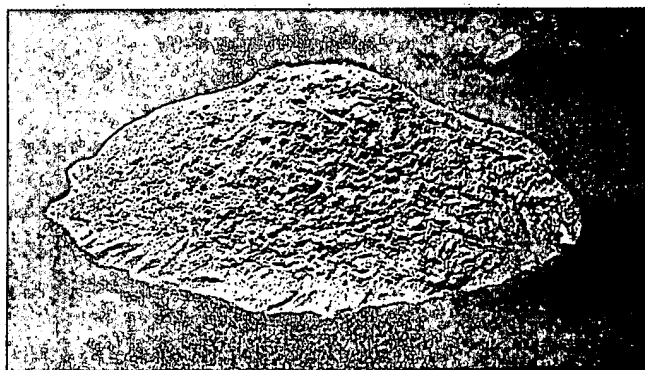


Fig. 3-3. Fly ash, a powder resembling cement, has been used in concrete since the 1930s. (69799)

common. Supplementary cementitious materials are used in at least 60% of ready mixed concrete (PCA 2000). ASTM C 311 provides test methods for fly ash and natural pozzolans for use as supplementary cementitious material in concrete.

FLY ASH

Fly ash, the most widely used supplementary cementitious material in concrete, is a byproduct of the combustion of pulverized coal in electric power generating plants. Upon ignition in the furnace, most of the volatile matter and carbon in the coal are burned off. During combustion, the coal's mineral impurities (such as clay, feldspar, quartz, and shale) fuse in suspension and are carried away from the combustion chamber by the exhaust gases. In the process, the fused material cools and solidifies into spherical glassy particles called fly ash (Fig. 3-2). The fly ash is then collected from the exhaust gases by electrostatic precipitators or bag filters. Fly ash is a finely divided powder resembling portland cement (Fig. 3-3).

Most of the fly ash particles are solid spheres and some are hollow cenospheres. Also present are plerospheres, which are spheres containing smaller spheres. Ground materials, such as portland cement, have solid angular particles. The particle sizes in fly ash vary from less than 1 μm (micrometer) to more than 100 μm with the typical particle size measuring under 20 μm . Only 10% to 30% of the particles by mass are larger than 45 μm . The surface

Table 3-1. Specifications and Classes of Supplementary Cementitious Materials

Ground granulated iron blast-furnace slags—ASTM C 989 (AASHTO M 302)
Grade 80
Slags with a low activity index
Grade 100
Slags with a moderate activity index
Grade 120
Slags with a high activity index
Fly ash and natural pozzolans—ASTM C 618 (AASHTO M 295)
Class N
Raw or calcined natural pozzolans including:
Diatomaceous earths
Opaline cherts and shales
Tuffs and volcanic ashes or pumicites
Calcined clays, including metakaolin, and shales
Class F
Fly ash with pozzolanic properties
Class C
Fly ash with pozzolanic and cementitious properties
Silica fume—ASTM C 1240

area is typically 300 to 500 m^2/kg , although some fly ashes can have surface areas as low as 200 m^2/kg and as high as 700 m^2/kg . For fly ash without close compaction, the bulk density (mass per unit volume including air between particles) can vary from 540 to 860 kg/m^3 (34 to 54 lb/ft^3), whereas with close packed storage or vibration, the range can be 1120 to 1500 kg/m^3 (70 to 94 lb/ft^3).

Fly ash is primarily silicate glass containing silica, alumina, iron, and calcium. Minor constituents are magnesium, sulfur, sodium, potassium, and carbon. Crystalline compounds are present in small amounts. The relative density (specific gravity) of fly ash generally ranges between 1.9 and 2.8 and the color is generally gray or tan.

ASTM C 618 (AASHTO M 295) Class F and Class C fly ashes are commonly used as pozzolanic admixtures for general purpose concrete (Fig. 3-4). Class F materials are generally low-calcium (less than 10% CaO) fly ashes with

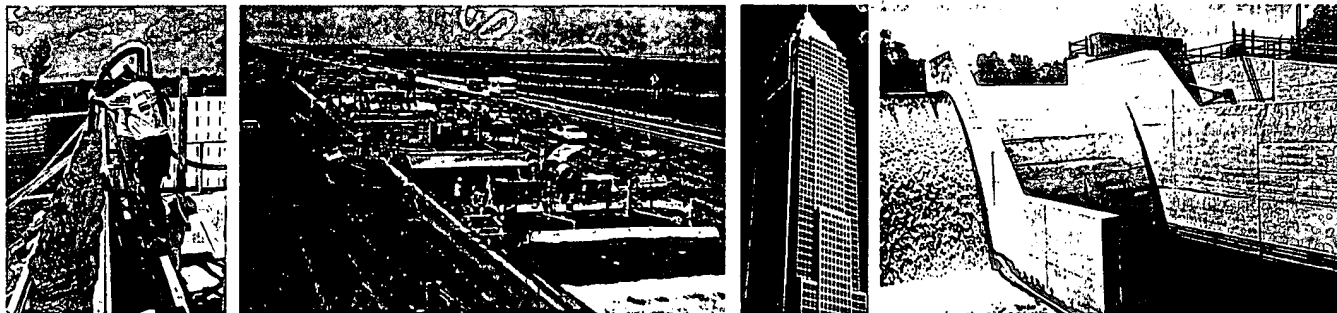


Fig. 3-4. Fly ash, slag, and calcined clay or calcined shale are used in general purpose construction, such as (left to right) walls for residential buildings, pavements, high-rise towers, and dams. (67279, 48177, 69554, 69555)

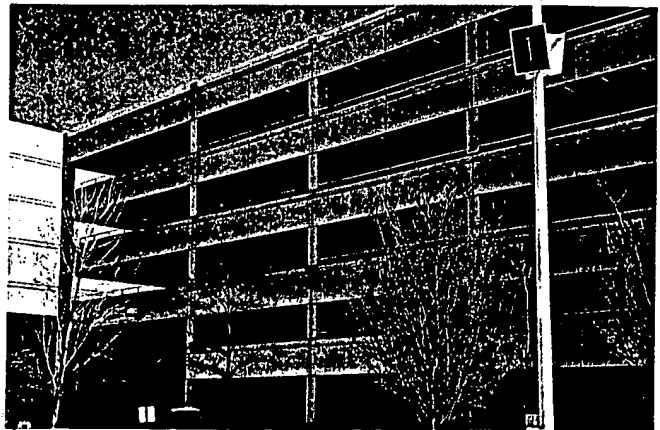
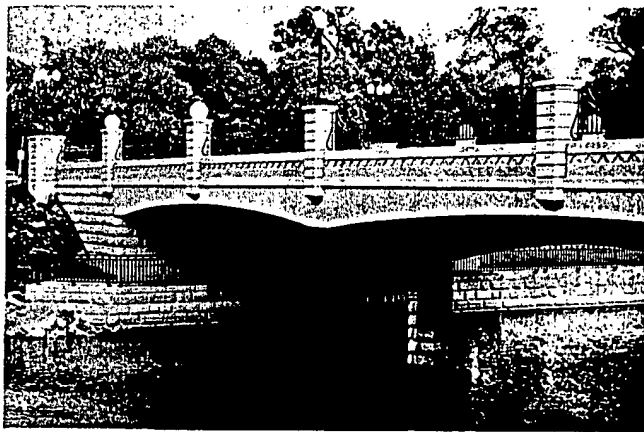


Fig. 3-9. Although they can be used in general construction, silica fume and metakaolin are often used in applications such as (left) bridges and (right) parking garages to minimize chloride penetration into concrete. (68681, 69542)

ground granulated blast furnace slag and ACI 233 (1995) provides an extensive review of slag.

SILICA FUME

Silica fume, also referred to as microsilica or condensed silica fume, is a byproduct material that is used as a pozzolan (Fig. 3-7). This byproduct is a result of the reduction of high-purity quartz with coal in an electric arc furnace in the manufacture of silicon or ferrosilicon alloy. Silica fume rises as an oxidized vapor from the 2000°C (3630°F) furnaces. When it cools it condenses and is collected in huge cloth bags. The condensed silica fume is then processed to remove impurities and to control particle size.

Condensed silica fume is essentially silicon dioxide (usually more than 85%) in noncrystalline (amorphous) form. Since it is an airborne material like fly ash, it has a spherical shape (Fig. 3-8). It is extremely fine with particles less than 1 μm in diameter and with an average diameter of about 0.1 μm , about 100 times smaller than average cement particles.

Condensed silica fume has a surface area of about 20,000 m^2/kg (nitrogen adsorption method). For comparison, tobacco smoke's surface area is about 10,000 m^2/kg . Type I and Type III cements have surface areas of about 300 to 400 m^2/kg and 500 to 600 m^2/kg (Blaine), respectively.

The relative density of silica fume is generally in the range of 2.20 to 2.5. Portland cement has a relative density of about 3.15. The bulk density (uncompacted unit weight) of silica fume varies from 130 to 430 kg/m^3 (8 to 27 lb/ft^3).

Silica fume is sold in powder form but is more commonly available in a liquid. Silica fume is used in amounts between 5% and 10% by mass of the total cementitious material. It is used in applications where a high degree of impermeability is needed (Fig. 3-9) and in high-strength concrete. Silica fume must meet ASTM C 1240. ACI 234 (1994) and SFA (2000) provide an extensive review of silica fume.

NATURAL POZZOLANS

Natural pozzolans have been used for centuries. The term "pozzolan" comes from a volcanic ash mined at Pozzuoli, a village near Naples, Italy, following the 79 AD eruption of Mount Vesuvius. However, the use of volcanic ash and calcined clay dates back to 2000 BC and earlier in other cultures. Many of the Roman, Greek, Indian, and Egyptian pozzolan concrete structures can still be seen today, attesting to the durability of these materials.

The North American experience with natural pozzolans dates back to early 20th century public works projects, such as dams, where they were used to control temperature rise in mass concrete and provide cementitious material. In addition to controlling heat rise, natural pozzolans were used to improve resistance to sulfate attack and were among the first materials to be found to mitigate alkali-silica reaction.

The most common natural pozzolans used today are processed materials, which are heat treated in a kiln and then ground to a fine powder (Figs. 3-10, 3-11 and 3-12); they include calcined clay, calcined shale, and metakaolin.

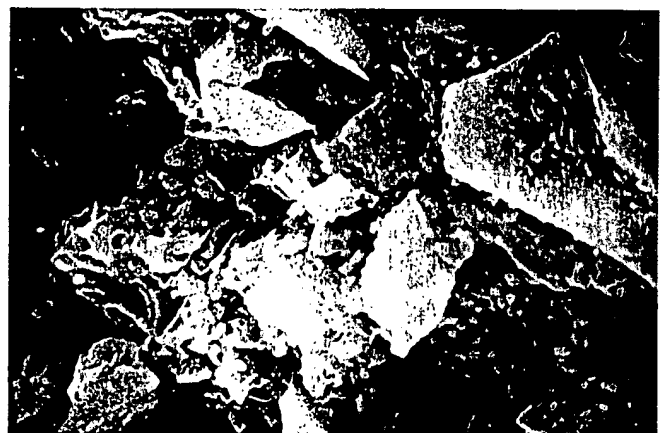


Fig. 3-10. Scanning electron microscope micrograph of calcined shale particles at 5000X. (69543)

PECAN



Pecan. (a) Leaves and fruit.
(b) Hulled nuts.

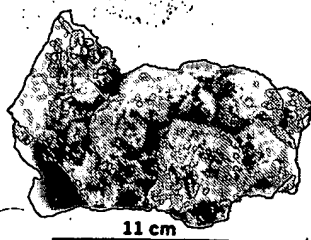
PECTINIBRANCHIA



2 mm

Shell of the small *Orthonema*,
from the Pennsylvanian-Permian.
(From R. R. Shrock and W. H.
Twenhofel, *Principles of
Invertebrate Paleontology*, 2d
ed., McGraw-Hill, 1953)

PECTOLITE



11 cm

Rock mass of needlelike
calcite crystals with calcite at
left, found in Paterson, New
Jersey. (American Museum of
Natural History Specimen)

Pearson Type I distribution See beta distribution.

pea-soup fog [METEOROL] Any particularly dense fog.

peat [GEOL] A dark-brown or black residuum produced by the partial decomposition and disintegration of mosses, sedges, trees, and other plants that grow in marshes and other wet places.

peat bog See peat bog.

peat bog [GEOL] A bog in which peat has formed under conditions of acidity. Also known as peat bed; peat moor.

peat formation [GEOCHEM] Decomposition of vegetation in stagnant water with small amounts of oxygen, under conditions intermediate between those of putrefaction and those of molding.

peat moss See peat bog.

peat moss [ECOL] Moss, especially sphagnum moss, from which peat has been produced.

peat-ampropol [GEOL] A product of the degradation of organic matter that is transitional between peat and sapropel. Also known as sapropel-peat.

peat soil [GEOL] Soil containing a large amount of peat; it is rich in humus and gives an acid reaction.

peat wax [MATER] A hard, waxy material extracted from peat; it is similar to, and a substitute for, montan wax.

peau de soie [TEXT] Soft silk satin-textured fabric having a slight luster and faintly showing fine ribs in the filling.

pebble [GEOL] A clast, larger than a granule and smaller than a cobble having a diameter in the range of 4-64 millimeters. Also known as pabbestone. [MINERAL] See rock crystal.

pebble armor [GEOL] A desert armor made up of rounded pebbles.

pebble-bed reactor [NUCLEO] A nuclear reactor in which the fuel consists of small spheres or pellets stacked in the core; the reaction rate is controlled by coolant flow and by loading and unloading pellets.

pebble coal [GEOL] Coal that is transitional between peat and brown coal.

pebble heater [CHEM ENG] Gas-heating device (for air, hydrogen, methane, and steam) in which heat is transferred to the gas via a countercurrent movement of preheated pebbles.

pebble mill [MECH ENG] A solids size-reduction device with a cylindrical or conical shell rotating on a horizontal axis, and with a grinding medium such as balls of flint, steel, or porcelain.

pebbles [MATER] Grinding media for pebble mills, usually balls of hard flint or hard burned white porcelain.

pebbles [TEXT] See orange peel.

pebbly mudstone [GEOL] A delicately laminated till-like conglomeratic mudstone.

pebbly sand [GEOL] An unconsolidated sedimentary deposit containing at least 75% sand and up to a maximum of 25% pebbles.

pebrino [INV ZOO] A contagious protozoan disease of silkworms and other caterpillars caused by *Nosema bombycis*.

pecan [BOT] *Carya illinoensis*. A large deciduous hickory tree in the order Fagales which produces an edible, oblong, thin-shelled nut.

pecary [VERT ZOO] Either of two species of small piglike mammals in the genus *Tayassu*, composing the family Tayassuidae.

peck [MECH] Abbreviated pt. 1. A unit of volume used in the United States for measurement of solid substances, equal to 8 dry quarts, or 1/4 bushel, or 37.603 cubic inches, or 0.00880976754172 cubic meter. 2. A unit of volume used in the United Kingdom for measurement of solid and liquid substances, although usually the former, equal to 2 gallons, or approximately 0.00909218 cubic meter.

pecking order [PSYCH] A social hierarchy of prestige, dominance, or authority. [VERT ZOO] A hierarchy of social dominance within a flock of poultry where each bird is allowed to peck another lower in the scale and must submit to pecking by one of higher rank.

Peclet number [CHEM ENG] Dimensionless group used to determine the chemical reaction similitude for the scale-up

from pilot-plant data to commercial-sized units; incorporates heat capacity, density, fluid velocity, and other pertinent physical parameters.

Pecora [VERT ZOO] An infraorder of the Artiodactyla; includes those ruminants with a reduced ulna and usually with antlers, horns, or deciduous horns.

pecton [ZOO] Any of various comblike structures possessed by animals.

Pectonidae [INV ZOO] A family of bivalve mollusks in the order Anisomyaria; contains the scallops.

pectic acid [BIOCHEM] A complex acid, partially demethylated, obtained from the pectin of fruits.

pectin [BIOCHEM] A purified carbohydrate obtained from the inner portion of the rind of citrus fruits, or from apple pomace; consists chiefly of partially methoxylated polygalacturonic acids.

Pectinaria [INV ZOO] The cone worms, a family of polychaete annelids belonging to the Sedentaria.

pectinase [BIOCHEM] An enzyme that catalyzes the transformation of pectin into sugars and galacturonic acid.

pectinesterase [BIOCHEM] An enzyme that catalyzes the hydrolytic breakdown of pectins to pectic acids.

pectinosis [ANAT] A muscle arising from the pubis and inserted on the femur.

Pectinibranchia [INV ZOO] An order of gastropod mollusks which contains many families of snails; respiration is by means of ctenidia, the nervous system is not concentrated, and sexes are separate.

Pectobothridia [INV ZOO] A subclass of parasitic worms in the class Trematoda, characterized by caudal hooks or both posterior suckers or both.

pectolite [MINERAL] $\text{NaCa}_2\text{Si}_3\text{O}_8(\text{OH})$ A colorless, white, or gray inosilicate, crystallizing in the monoclinic system, having a vitreous to silky luster; hardness is 5 on Mohs scale, and specific gravity is 2.75.

pectoral fin [VERT ZOO] One of the pair of fins of fish corresponding to forelimbs of a quadruped.

pectoral girdle [ANAT] The system of bones supporting the upper or anterior limbs in vertebrates. Also known as shoulder girdle.

pectoralis major [ANAT] The large muscle connecting the anterior aspect of the chest with the shoulder and upper arm.

pectoralis minor [ANAT] The small, deep muscle connecting the third to fifth ribs with the scapula.

pector part [ORD] A part of ordnance for which the design is controlled by a single manufacturer, and the use is restricted to items produced by a single manufacturer.

pector star [ASTRON] A star that does not fit into a standard spectral classification.

pector velocity [ASTRON] Superposed on the systematic rotation of the galaxy are individual motions of the stars; each star moves in a somewhat elliptical orbit and therefore has a velocity of its own (peculiar velocity) to the local standard of rest, the standard moving in a circular orbit around the galactic center.

pedal [BIOL] Of or pertaining to the foot. [DES ENG] A lever operated by foot.

pedal disk [INV ZOO] The broad, flat base of many anemones, used for attachment to a substrate.

pedalifer [GEOL] A soil in which there is an accumulation of sesquioxides; it is characteristic of a humid region.

pedal ganglion [INV ZOO] One of the paired ganglia supplying nerves to the foot muscles in most mollusks.

pedal gland See foot gland.

pedato [BIOL] 1. Having toe-like parts. 2. Having a foot. 3. Having tube feet.

pedestal [CIV ENG] 1. The support for a column. 2. A masonry support carrying one end of a bridge truss or girder and transmitting any load to the top of a pier or abutment. [ELECTR] See blanking level. [ENG] A supporting part or base of an upright structure, such as a radar antenna. [GEOL] A relatively slender column of rock supporting a wider rock mass and formed by undercutting as a result of wind abrasion or differential weathering. Also known as rock pedestal.

pedestal boulder [GEOL] A rock mass supported on a rock pedestal. Also known as pedestal rock.

pedestal level See blanking level.

EXTRUSION MOLDING METHOD OF INORGANIC MOLDED BODY

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Abstract of JP6157115

PURPOSE: To obtain an inorganic molded body excellent in a extrusion molding property and superior in the bending strength and in the water resistance by extruding a mixture mixed a powder compound consisting of cement and silica fume, etc., with a prescribed quantity of high performance water reducing agent and an epoxy resin, etc. **CONSTITUTION:** A powder compound consisting of, % by weight, 30-70% Portland cement, 3-30% fine blast furnace slag powder and/or fly ash, 3-30% silica fume, 0-50% silica sand powder, and 0-5% gypsum, etc., is prepared. For 100% of the compound, 0-2.5% (for the cement) the high performance water reducing agent (for example, naphthalene sulfonic acid), 1-9% (as the resin solid content) the epoxy resin and water are uniformly mixed. Next the compound is extruded, thus the inorganic molded body superior in bending strength and water resistance is obtained.

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